Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ AP Biology

Epigenetics WebQuest

Go to <http://learn.genetics.utah.edu/content/epigenetics/> and click through the sections listed below. Answer the assessment questions as thoroughly as you can.

What Is Epigenetics?

*The development and maintenance of an organism is orchestrated by a set of chemical reactions that switch parts of the genome off and on at strategic times and locations. Epigenetics is the study of these reactions and the factors that influence them.*

**THE EPIGENOME AT A GLANCE**

1. Describe the physical state of the genome (tightly wrapped, or relaxed) when genes are inactive.
2. Describe the physical state of the genome when genes are active.

**GENE CONTROL**

1. **Describe the following characteristics when a gene is active:**
   1. Is the gene tightly or loosely wound around histones?
   2. Are there many or few methyl molecules attached to the gene?
   3. Are there many or few acetyl molecules attached to the genes associated histones?
   4. Are there many or few mRNA transcripts?
2. **Describe the following characteristics when a gene is inactive:** 
   1. Is the gene tightly or loosely wound around histones?
   2. Are there many or few methyl molecules attached to the gene?
   3. Are there many or few acetyl molecules attached to the genes associated histones?
   4. Are there many or few mRNA transcripts?

**THE EPIGENOME LEARNS FROM ITS EXPERIENCES**

1. True or False. Cell signals play a role in shaping gene expression only during development.
2. What molecule is primarily responsible for carrying cell signals to DNA?
3. What are the two functions of gene regulatory proteins?
4. Are epigenetic tags passed to daughter cells?

Epigenetics and the Environment

*The genome dynamically interacts with the environment as chemical switches that regulate gene expression receive cues from stress, diet, behavior, toxins and other factors.*

**IDENTICAL TWINS: PINPOINTING ENVIRONMENTAL IMPACT ON THE EPIGENOME**

1. Often, the physical characteristics of genetically identical twins become increasingly different as they age, even at the molecular level. Explain why this is so. (use the terms "environment" and "epigenome")
2. Name 3-4 environmental factors that influence the epigenome.
3. What is an imprinted gene?

**LICK YOUR RATS**

1. Explain how a high-nurturing mother rat shapes her pup's epigenome, and what that pup's response to stress will be.
2. In rats, does licking by the mother activate, or deactivate her pup's GR gene?
3. Explain how cortisol and the GR protein work together in the brain to relax a rat pup. You may draw a diagram.
4. The rat nurturing example shows us how parental behavior can shape the behavior of their offspring on a biochemical level. Relate this to humans and think about the personal and social implications. Record your thoughts. (continue onto the next page if you need room)

**NUTRITION & THE EPIGENOME**

1. Explain how the food we eat affects gene expression.
2. Can the diets of parents affect their offspring's epigenome? If so, how?

**EPIGENETICS & THE HUMAN BRAIN**

*The video might not have any sound, but there is some text below that contains some interesting information. Read through the points made, do some additional internet searches if necessary, and respond to the following questions.*

1. How does child abuse leave an epigenetic mark on the brain? Which gene is tagged?
2. How could this information be used in potentially treating victims of child abuse or perhaps those suffering from post traumatic stress disorder?

**FINAL THOUGHTS**

1. How has this WebQuest changed your thoughts on the “Nature vs. Nurture” debate?
2. If you were able to conduct further research on epigenetics, on what aspect would you focus your studies? What kind of information would you hope to discover? How would you use this information?